Bioarchaeology Group Discussion Synthesis

Bioarchaeology is a branch of archaeology that uses the biological material from animals, humans and plants to address a panel of questions related to human way of life, environmental conditions, climatic changes and other issues that allow the understanding of the past societies and cultures from late Pleistocene to the premodern periods. Bioarchaoelogical studies are divided in several specialities we describe briefly below.

Biological Anthropology is the study of human biological variation and evolution by exploring human variation using identical biological principles and methods regardless the geographical or chronological context of the studied sample. It deals with the place of humans in nature, the pattern of our evolution as a species, and the way in which past populations interact with their environment. The applications of the biological anthropology, both in the field and in the laboratory, are for instance:

- ***Archaeothanatology*** that consists in reconstructing the funeral gestures and the taphonomy of the corpse by observing the initial position of the deceased, the mode of deposit of the body, its environment of decomposition, the contemporaneity deposits in the case of plural burials and modes of burial.
- ***Osteobiography*** that consists of generating data from a skeleton (age at death, sex, stature) to identify the biological identity of individuals then the population.
- ***Paleopathology*** that is the study and application of methods and techniques for investigating diseases and related conditions from skeletal remains.

Osteoarchaeological assemblages are composed of single primary burials or collective tombs with mixed bones resulting from generational use of cemeteries and habitation spaces. Others are fragmented and become commingled due to taphonomic processes (i.e. flooding, geological events).

Archaeobotany

Archaeobotany is a bioarchaeological method studying micro- and macro- plant remains recovered on archaeological sites. Macrobotanical studies include anthracology and the analysis of fruits, grains, seeds, chaff and floral parts, usually preserved by charring in the Near East. Anthracology consists in the analysis of wood charcoals and reflects the natural vegetation surrounding sites as well as the exploitation of wood for various activities such as fuel, construction.

Archaeobotanical studies provide information on subsistence strategy, plant economy, agricultural practices and on the vegetation around sites. It may also be an indicator of climate or socio-political changes and how it impacted plant distribution and exploitation, and human adaptation to changes.

Archaeozoology

Alike Archaeobotany, Archaoezoology provides information on biodiversity of terrestrial, avian, and aquatic animal resources and the evolution of their exploitation through time. A large panel of faunal species is concerned by these studies that can be divided in two large categories, vertebrate and nonvertebrate. Among vertebrates, bones of mammals, birds, amphibians & reptiles, fishes are studied by specialists of these groups and among the nonvertebrates, shell remains of molluscs and arthropods (insects, arachnids and crustaceans) are studied by malacologists and entomologists. Within the latter, the insects and parasites (external and internal) remains can be studied in appropriate environments and conditions for their preservation. They provide valuable information on agricultural practice, diet and health.

Animal hard material (bone, shell, ivory etc..) is also a valuable source for the combined study of technological skill of each society and the way they make use of natural resources.

Finally, animals have had all along the human history a symbolic value and their link to mental and cultural representations of ancient societies constitutes an important research focus in archaeological studies from prehistoric to historical periods.

Molecular Archaeology

- ***Palaeogenetics*** is a new field of research that has opened new avenues to understand the history of past animals and human populations. This has been possible thanks to DNA extracting from bones and teeth of vertebrates and the development of DNA amplification (PCR). The genetic and genomic data obtained in recent decades have shown that human and animal history is complex and that modern populations are the result of numerous introductions, spread, migrations and colonisations that favoured crossbreeding between different groups, sometimes very distant. The data obtained via paleaogenetic analyses allows the characterization of haplogroups using maternal lineages (mitochondrial DNA) and paternal lineages (Y chromosome) in order to examine the genetic structure of groups, to compare biological and cultural diversity, to rise hypotheses for the establishment and origin of animal and human populations.
- ***Isotopic approaches*** have two main objectives that are the reconstruction of past way of lives, the diet and the mobility of humans and animals. This is possible because living organisms can record in their tissues the characteristics of the environment in which they have lived. Biochemists measure the biochemical contents of human, animal and plant remains either on collagen or apatite. Stable isotope ratios are measured with mass spectrometers. These measures are interesting to characterize the contribution to the diet of food products with high trophic level, such as animal proteins (domestic and wild animals, meat/milk), and freshwater fish, versus low trophic level, such as cereals, for example wheat, barley or millet. The most used elements on the organic part are carbon, nitrogen and more recently sulfur, to decipher the contribution of fresh water and marine resources. On the inorganic part, in addition to previous elements oxygen and strontium are used to address mobility of past human and animal populations and links between populations. More recently, intra-sequential isotope analysis along the teeth is being studied to examine dietary and mobility changes over the individual's lifetime.

Bioarchaeological studies in the ARWA region are numerous and have provided exceptional results for understanding the mechanisms of domestication, the spread of animal and plants, the movement of populations and have contributed to the understanding of the organisation of human societies with an unprecedent resolution. However, a common problem is encountered in Western Asia, this wide geographic region located in an arid / semi-arid zone, dominated by very high mountains, deserts, oases, with contrasted continental and tropical areas and high temperature variations. On the long term, these physical and climatic features have had an effect on the preservation of bioarchaeological material and constitute a major issue and limitation for applying systematically the methods described above.

Our group, composed of specialists of the fields described above, constitutes a multidisciplinary think-thank to stimulate new common projects and exchange of knowledge on challenging and novel directions of research regarding bioarchaeological studies in the ARWA region.